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Defense Nuclear Agency
Fiscal Year 1991

Program Document

Research, Development, Test and Evaluation, Defense Agencies (U)

(Supports Congressional Budget Estimates)
January 1990

UNCLASSIFIED

FISCAL YEAR 1991 BUDGET ESTIMATES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION DESCRIPTIVE SUMMARIES

DEFENSE NUCLEAR AGENCY

JANUARY 1990

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DEFENSE NUCLEAR AGENCY

JANUARY 1990

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602109H
PE Title: Superconductive Magnetic Energy Storage
Project Number: A
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Superconductive Magnetic Energy Storage	- 0 -	11000	15000	131000

B. BRIEF DESCRIPTION OF PROJECT: This project covers the design, construction, and test of a Superconductive Magnetic Energy Storage (SMES) Engineering Test Model (ETM) to demonstrate the feasibility of using SMES technology to provide the prime power for applications requiring large amounts of stored energy. The ETM will be capable of storing 20 Megawatt hours of electrical energy and discharging it at power rates from 10 to 400 Megawatts. Associated component designs, developmental experiments, trade-off studies, costing studies, impact assessments and implementation planning will also be performed.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

This is a new project starting in FY 1990.

Current Year Plans:

- Conduct component tests of SMES main conductors, support struts, structural sport elements, and power conditioning system circuits.
- Build a full scale constructability model of one strut to strut segment.
- Conduct an integrated scaled proof of principle experiment.
- Study foundation and structural design integration alternatives and complete trade-off studies.
- Complete preliminary integrated Engineering Test Model Designs.
- Develop draft Engineering Test Model Test Plan.
- Select construction site.
- Select prime construction contractor.

FY 1991 Planned Program:

- Complete final engineering design for Engineering Test Model.
- Complete site preparation and licensing.
- Begin Engineering Test Model Construction.
- Conduct tests of SMES power conditioning system components and helium dump protection system components.
- Develop Utility interface specification.

D. WORK PERFORMED BY: Two prime contractors and fourteen subcontractors, one university, and three Federal Government agencies perform research funded by this program. Only Bechtel National Inc., CA ($16M) and Ebasco Services Inc., NY ($16.1M) receive $10 million or more. No in-house research is performed.

E. RELATED ACTIVITIES: PE #0603221C, Strategic Defense Initiative, Key Technologies project sponsored this program before it was established as a separate Program Element. SDIO continues to monitor this activity and conduct integration studies to ensure an interface on the Ground Based Free Electron Laser Technology Integration Experiment can be achieved. There is no unnecessary duplication of effort within the Department of Defense.

F. OTHER APPROPRIATION FUNDS: None

DEFENSE NUCLEAR AGENCY
FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARIES

(U) Program Element: #0602715H
(U) Title: Defense Nuclear Agency (DNA)
(U) Mission Area: #540-Defense Nuclear Agency
(U) Budget Activity: #1-Technology Base

(U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number		FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate
#0602715H	DEFENSE NUCLEAR AGENCY	329532	326849	355066
A	Aerospace Systems Vulnerability and Hardening	17330	14683	19300
B	Atmospheric Effects and Mitigation	13317	14763	15500
D	Vulnerability/Assessment and Data Evaluation	27530	27417	30066
F	Nuclear Survivability and Security	9331	9111	9500
G	Effects Testing Using Simulators	16297	16068	16500
H	Effects Testing Using High Explosives	11453	15083	21000
J	Underground Nuclear Tests	98703	120342	119500
L	Laboratory Radiation Simulator Development	17018	19132	20000
M	Biomedical Effects	23682	24844	27500
N	Tactical Systems Vulnerability and Hardening	10168	10344	8900
O	Strategic Nuclear Implications and Assessments	6570	6396	5900
S	Strategic Structures Vulnerability and Hardening	33004	23055	32300
V	Nuclear Effects on Electronics	24829	25611	29100
W	Small Business Innovation Research	3800	- 0 -	- 0 -
X	Bioenvironmental Hazards Research	16500	- 0 -	- 0 -

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H Title: Defense Nuclear Agency (DNA)

A. RESOURCES: ($ in Thousands)

FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
329532	326849	355066	Continuing

B. BRIEF DESCRIPTION OF PROGRAM: This research and development program explores and develops technology to improve the nuclear survivability and effectiveness of U.S. strategic and non-strategic weapons systems and forces, and the command control and communications systems needed to operate those systems and forces in a nuclear conflict. This program is particularly responsive to the new environments of arms limitation and fiscal constraint by providing technology necessary for more survivable and effective military systems, thereby maintaining the credibility of our strategic deterrent. Research efforts encompass:

o Conduct theoretical and experimental research on the effects of nuclear weapons to advance the technology base and our understanding of the survivability of military systems, vulnerabilities of target systems, and operational limitations of current and advanced systems;

o Execution of underground nuclear tests;

c Development and operation of simulators (radiation, blast and thermal effects) and conduct of field measurements to evaluate effects on military systems;

o Development of theoretical and experimental techniques for predicting and evaluating the effects of nuclear detonations on the environment, military command and control, and other systems;

o Collection and evaluation of information on nuclear weapon and directed energy effects to improve the survivability, effectiveness and safety of weapons systems, command, control and communications systems, and satellite systems;

o Utilization of nuclear weapon effects information to improve the methodologies for weapon assignment, target allocation and other factors to permit optimum use of available assets;

o Conduct of biomedical effects research to protect military personnel from the effects of radiation in a nuclear environment.

C. PROGRAM ACCOMPLISHMENTS AND PLANS: (See Project summaries which follow)

D. WORK PERFORMED BY: More than 100 private businesses, 35 Service labs, 10 colleges/universities, and 15 other Federal Government agencies perform research funded by this program. Only the Department of Energy ($63M) and the Los Alamos National Lab, NM ($16.5M) receive $10 million or more. In-house work in Biomedical Effects is performed at DNA's Armed Forces Radiobiology Research Institute in Bethesda, MD ($17.8M).

E. RELATED ACTIVITIES: P.E. #0101313, Strategic War Planning System- SIOP automation efforts in Project "O" are part of a joint development program with JSTPS and HQSAC. DNA is the technical manager and program review is at the "flag" level. There is no unnecessary duplication of effort within the Department of Defense.

F. OTHER APPROPRIATION FUNDS:

	FY 1989	FY 1990	FY 1991
1. Construction	- 0 -	900	- 0 -
2. Operations & Maintenance	24940	25834	26222

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H | Project Number: A
PE Title: Defense Nuclear Agency | Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Aerospace Systems Vulnerability and Hardening	17330	14683	19300	Continuing

B. BRIEF DESCRIPTION OF PROJECT: Provides theoretical and experimental research to define nuclear environments and effects. This project is structured to reduce the vulnerability and increase the effectiveness of strategic and theater nuclear weapons & delivery systems. Efforts address nuclear induced air blast; thermal radiation; lofted dust, debris and ejecta including ice clouds such as may be encountered in a nuclear conflict. Environmental data are used to improve weapon allocation and timing in Single Integrated Operations Plan (SIOP) development and to identify new system hardness requirements. Required survivability is achieved through use of appropriate materials, design techniques and structural modifications. Efforts are closely coordinated with the Services, Joint Strategic Target Planning Staff (JSTPS) and the intelligence community with direct support to Service Program Managers Acquisition Executives.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:
- o Conducted Dust/Smoke ingestion testing on the advanced turbofan engines.
- o Updated Re-entry Vehicle (RV) response codes for targeting applications and fratricide evaluations performed by Strategic Systems Program Office (SSPO) and Strategic Air Command (SAC).
- o Conducted Ballistic Re-entry Vehicle (BRV) fly-thru of a simulated nuclear dust cloud generated in the MISERS GOLD high explosive test.

Current Year Plans:
- o Characterize Trans/Post SIOP dust/smoke/ice cloud environments to assess aircraft survivability.
- o Initiate development of thermoreactive aircraft coating to provide thermal protection of advanced composite materials.
- o Determine feasibility of developing an airborne nuclear hazard avoidance mitigation system.
- o Design underground nuclear test to evaluate airblast effects on hardened structures.

FY 1991 Planned Program:
- o Initiate aircraft response modeling program adaptable to personal computers to assess aircraft interaction with nuclear environment.
- o Determine specific vulnerability of Vertical/Short Takeoff and Landing (V/STOL) aircraft to nuclear effects in support of classified mission.
- o Complete development of integrated passive thermal protection system for military aircraft.
- o Conduct dust ingestion testing on propulsion systems.
- o Complete thermoreactive coating development.
- o Initiate fielding of experiment to evaluate airblast effects on hardened structures.
- o Determine RV response to fratricide environments.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: B
Budget Activity: Technology Base

A. RESOURCES: ($ In Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Atmospheric Effects & Mitigation	13317	14763	15500	Continuing

B. BRIEF DESCRIPTION OF PROJECT: Provides information to system developers and users on the properties of nuclear environments that degrade performance of Command, Control and Communication (C^3), radar, and infrared sensor systems by disrupting or masking their signals. Develops and applies methods to evaluate, improve, and test systems performance in nuclear environments. The FY 91 budget increase will provide timely data and technology to achieve nuclear hardness in the design of the Boost Surveillance and Tracking System, other sensor and C^3 systems for SDIO/USAF/USA, and the Defense Satellite Communication System Follow-On.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments

- Completed evaluation of strategic Very Low Frequency (VLF) communications.
- Provided data on multiple burst nuclear effects for Strategic Defense Initiative (SDI) sensor and C^3 systems.
- Performed initial evaluation of PAVE PAWS radars in nuclear war conditions and results are currently being collected.
- Initiated nuclear infrared (IR) clutter simulator for testing space based sensors.
- Distributed "Weapons Effects on Meteor Burst Communications" systems code.
- Completed GRANITE VISTA II evaluation of High Frequency (HF) radios for USAF Space Command.
- Conducted scintillation tests on Military Strategic and Tactical Relay System (MILSTAR).

Current Year Plans

- Complete draft revision of DoD-STD-2169A for High altitude ElectroMagnetic Pulse (HEMP).
- Complete new DNA Specification of Nuclear Disturbed Signals for radio and radar system design applications.
- Use DNA link simulators to test the Universal Modem (radio receiver for Defense Satellite Communication Systems (DSCS) that provides interservice and interallie communications) and MILSTAR systems.
- Initiate radar propagation simulator for space borne radars.
- Complete support for the Defense Support Program (DSP) Satellite Readout Station Upgrade.
- Complete World Wide Military Command and Control System (WWMCCS) Airborne Resources (WABNRES) assessment and noise model.
- Execute radar discrimination experiment in simulated "nuclear" environment.

FY 1991 Planned Program

- Complete evaluation of space based radar systems in simulated nuclear environments.
- Complete first nuclear IR clutter simulator for testing IR sensors.
- Define large scale magnetohydrodynamic HEMP threat envelope.
- Complete mitigation methods for nuclear effects on PAVE PAWS radars.
- Complete evaluations for the Defense Satellite Communication System Follow-On satellite and the Universal Modem System.
- Upgrade nuclear environment predictions for VLF communications.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: D
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Vulnerability/Assessment and Data Evaluation	27530	27417	30066	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project provides for evaluation of major weapon systems during development to ensure the nuclear survivability criteria are adequately addressed; for computational capability used in the analytical assessment of Nuclear Weapons Effects (NWE) on U.S. forces and systems; and for development, collection, and transfer of technical information on NWE technology and phenomenology to system developers and users.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

- Continued to provide classified and unclassified scientific computing resources to ensure state-of-the-art, cost effective computational capability in support of numerical NWE analysis.
- Provided DoD program managers and weapon system developers with guidelines on incorporation and validation of nuclear hardness.
- Developed a data base of Nuclear Hardness and Survivability (NH&S) technologies/ information generated by DNA RDT&E programs to permit more efficient transfer of information to users.
- Continued to update current volumes of the Nuclear Weapon Effects reference set and develop new volumes to complete the set to benefit entire NWE research community.

Current Year Plans:

- Publish and distribute Nuclear Weapon Effects data and computational aids for X-ray, thermal and Electromagnetic Pulse (EMP) effects.
- Investigate techniques to improve NWE computational code development and analysis.
- Refine the database and update the information on new and emerging NH&S technologies generated by DNA RDT&E programs, with increased emphasis on advanced technologies for dissemination of such information.

FY 1991 Planned Program:

- Provide parallel processing, 3-D modules, expert systems techniques and advanced graphics capabilities to support NWE analysis, simulation and modeling.
- Complete the Program Manager's Guide to Nuclear Survivability and the Nuclear Hardness Test Planning Guide, both are needed to permit the incorporation of nuclear hardening into new weapon systems.
- Continue to update the information on new and emerging technologies generated by DNA RDT&E programs to benefit the entire NWE research community.
- Continue to provide classified and unclassified scientific computing resources to ensure state-of-the-art, cost effective computational capability in support of numerical NWE analysis, simulation, and modeling.
- Complete development of computational aids on nuclear targeting, System Generated EMP and fallout.
- Continue to publish and distribute Nuclear Weapon Effects reference data.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: F
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Nuclear Survivability and Security	9331	9111	9500	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project develops concepts and technology to improve survivability of nonstrategic nuclear forces to ensure nuclear forces remain a credible deterrent. The project consists of numerous sub-projects which collectively enhance nuclear force survivability across the entire DoD stockpile-to-target sequence. Projects are closely coordinated with the Services/operational commands. Successful research efforts are transitioned to the Services. Beginning in FY 1989 DNA physical security RDT&E funding was transferred to OSD in accordance with the FY 1989 Appropriations Act. DNA continues to manage exploratory development physical security efforts for OSD, but those efforts are no longer part of this descriptive summary.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

o Initiated Allied Command Europe (ACE) Alternate War HQs Deceptive Practices Program to enhance Non Strategic Nuclear Forces (NSNF) survivability.

o Conducted a limited demonstration to evaluate the concept of lateral dispersal on survivability of dual-capable aircraft.

o Evaluated deceptive practices options to improve the survivability of major nonstrategic nuclear command and control elements.

o Initiated Navy Underground Storage System development.

o Demonstrated and assessed High Frequency (HF) Groundwave Technology.

Current Year Plans:

o Initiate efforts to examine weapons storage alternatives for replacement of current igloo/storage sites.

o Initiate survivability analysis of NATO Nuclear Command and Control (C2) systems.

o Initiate Transportable Safety container development for Army weapons.

o Complete preliminary design of Navy Underground Storage System.

o Complete testing of HF Ground Wave phenomenology.

FY 1991 Planned Program:

o Continue Transportable Storage System exploratory development.

o Continue ACE Alternate War HQs Deceptive Practices Program into Phase II.

o Complete Survivability Analysis Model (DART) and provide to Services/ Commanders-in-Chief/NATO Communication and Information Systems Agency/Supreme Headquarters Allied Powers Europe/Defense Communications Agency (SVCS/CINCS/NACISA/SHAPE/DCA).

o Continue testing of Deceptive Practices Concepts.

o Continue Lateral Dispersal Command, Control and Communication (C3) and Security Concepts Testing.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: G
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Effects Testing Using Simulators	16297	16068	16500	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project provides for the generation of nuclear weapons effects data and for the testing of strategic and non-strategic systems and components through operation of laboratory radiation and field thermal simulators. Data is used to guide and evaluate hardness of system designs against high altitude electromagnetic pulse (EMP), system generated EMP, source region EMP, enhanced EMP (EHEMP), microwave, transient radiation effects on electronics, thermomechanical shock, air blast, and thermal effects. Project efforts enhance military system survivability by providing a means of relatively low cost evaluation of system/system component hardness throughout the system design process prior to final system validation, if required, on an underground nuclear effects test.
The funding requested is required to develop advanced thermal radiation simulators and to upgrade both the Advanced Research Electromagnetic Simulator (ARES) and the EHEMP simulator.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

o Refurbished pulser and instrumentation on ARES to partially meet DoD EMP Standard DoD-2169.

o Continued Nuclear Weapons Effects (NWE) testing of DoD weapon systems to include the Heavy Armor System, Fiber Optic Guided Missile (FOG-M), Military Strategic and Tactical Relay System (MILSTAR), Multiple Rocket Launcher System (MRLS) and Army Tactical Missile System (ATACMS). MX/Rail Garrison, Small Intercontinental Ballistic Missile (SICBM), Navy UHF follow-on satellite, Boost Surveillance and Tracking System (BSTS), Space Surveillance and Tracking System (SSTS), Exoatmospheric Reentry Vehicle Interceptor System (ERIS), and High Endoatmospheric Defense Interceptor (HEDI).

o Supported DNA EHEMP testing and DoD users concerned with EHEMP effects.

o Enhanced the output of thermal radiation simulators to more realistically represent the anticipated operational environment.

Current Year Plans:

o Upgrade the ARES capability to permit testing of systems at the levels required by the new DoD EMP standard (DoD-2169).

o Perform EMP testing on new Air Force Intercontinental Ballistic Missile (ICBM) Super High Frequency (SHF) Satellite Terminal (ISST).

o Perform X-ray testing on the Navy Follow-on Communication satellite.

o Improve the EHEMP simulator instrumentation capability and provide necessary upgrades to support EHEMP testing.

o Continue to develop advanced thermal radiation simulators to improve the fidelity of thermal effects testing of tactical and strategic systems.

o Perform EMP testing on the Nuclear Detection System component (NDS).

FY 1991 Planned Program:

o Continue support to weapon system developers in assessing effects of EMP.

o Continue NWE X-ray testing of military systems using DNA simulators.

o Continue to supply oversight and advice to various EMP simulator operators and weapon system designers concerned with EHEMP effects.

o Continue to provide a large area thermal radiation simulator for full scale systems testing.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: H
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Effects Testing Using High Explosives	11453	15083	21000	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project evaluates the survivability and vulnerability of strategic and non-strategic military systems/sub-systems through simulated nuclear blast and shock effects. Large scale high explosive tests are conducted to generate air blast, ground shock, cratering, ejecta, and dust cloud effects that cannot be obtained from underground nuclear effects systems tests. Project efforts also provide high-fidelity simulation testing for investigating nuclear air blast and shock phenomenology and validating prediction codes. This project offers the primary means to obtain key blast and shock effects data that guides development of weapons systems and the targeting of strategic and non-strategic systems. This project provides for evaluating differences between conventional weapons effects and nuclear weapons effects. This project provides for a large scale system tests every other year, phenomenology tests annually, and conventional weapons tests annually.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

Prior Year Accomplishments:

- o Executed MISERS GOLD for tactical and strategic system validation.
- o Planned and executed a phenomenology rarefaction material properties test (MIDNIGHT HOUR), and prepare for small-scale structure testing (MINERAL FIND).
- o Executed conventional weapons MK83 bomb test (DIPOLE AXIAL).

Current Year Plans:

- o Execute MINERAL FIND 1-4, and initiate preparation for MINERAL 5&6 small scale structure response tests using a High Explosive Simulation Test (HEST) simulation technique.
- o Initiate preparations for Underground Simulation Test program to study hardness of underground facilities, and execute material properties calibration test.
- o Execute MIDNIGHT HOUR 2 rarefaction test and prepare for MIDNIGHT HOUR 3.
- o Prepare for a 4KT large scale systems test (DISTANT IMAGE). Provide blast/shock environment for survivability/vulnerability of defense systems.
- o Execute three conventional weapons tests (DIPOLE BLADE).

FY 1991 Planned Program:

- o Execute a 4KT high explosive test to validate survivability of Army tactical weapon systems, Navy radar and communication antennas, and NATO field fortifications.
- o Execute high explosive phenomenology tests to investigate the hardness of various Intercontinental Ballistic Missile (ICBM) silo designs.
- o Execute a high explosive phenomenology test to investigate ground shock produced by a earth penetrating weapon.
- o Prepare for a high explosive phenomenology test to investigate the effects of layered geology on ground shock propagation.
- o Develop a high explosive simulator to investigate cratering effects and resulting ground shock produced by a surface explosion.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: J
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Underground Nuclear Tests	98703	120342	119500	Continuing

B. BRIEF DESCRIPTION OF PROJECT: Underground Nuclear Effects Testing provides nuclear environments to test/verify the Nuclear Hardness and Survivability (NH&S) of weapon systems, to resolve design questions at key decision points in weapon system development and to expand the nuclear effects technology base. Existing or planned simulators cannot provide realistic nuclear environments over a large enough area for testing of complete systems. Additionally, calculational methods cannot account for the interacting effects which occur in an exposure to real nuclear radiation. This ability to expose entire systems (e.g. full stages of ballistic missiles) is indispensable. Every major U.S. strategic system (except one) has undergone design changes to correct NH&S weaknesses discovered in an underground nuclear test.

These tests will include experiments to evaluate the survivability of emerging strategic and theater offensive, defensive, surveillance and communication systems and test the effectiveness of new concepts such as the Earth Penetrating Weapons (EPW) system against deep underground hard targets. These tests will directly support the Air Force, the Army, the Navy, and the Strategic Defense Initiative Office (SDIO) advanced development programs. Also supported will be research in NH&S to counter future threats.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

Prior Year Accomplishments:

o Completed and executed two underground nuclear effects tests. The main test executed is in direct support of TRIDENT II.

o Began preparation for two future tests to evaluate the vulnerability of Army theater systems to source region electromagnetic pulse (EMP).

o Continued preparation for an underground nuclear effects test to directly support SDIO.

Current Year Plans:

o Conduct and execute one underground nuclear effects tests. This main test is in direct support of SDIO.

o Begin preparations for a SDIO development and Air Force (AF) decoy development/advanced re-entry vehicle test (supports the AF advanced strategic missile systems program).

o Continue preparations for a source region EMP test for Army theater systems.

o Continue preparations for a low yield cavity test designed to investigate non-ideal airblast effects relevant to targeting hard strategic targets.

FY 1991 Planned Program:

o Conduct one nuclear effects tests designed specifically to calibrate a nuclear source for testing Army tactical systems.

o Continue preparation for SDIO full system development testing.

o Continue preparations for a source region EMP test for Army theater systems.

o Continue preparations for a low yield cavity test designed to investigate non-ideal airblast effects relevant to targeting hard strategic targets.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H Project Number: L
PE Title: Defense Nuclear Agency Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Laboratory Radiation Simulation Development	17018	19132	20000	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This effort develops high power pulsed electrical generators capable of producing large x-ray yields in the laboratory, for the testing of military systems to nuclear radiation effects. Laboratory radiation simulators provide a highly cost-effective means to determine if mission-essential military systems will survive when exposed to a nuclear radiation environment. Only small devices can be tested at present. Through this project, threat-level yield will be produced over areas large enough to test the ensembles of satellite electronics and small strategic weapon systems. This project is essential to evaluating the capability of satellites and improving confidence in the survivability of major military weapon systems to survive and operate during a nuclear conflict. Additionally, the order-of-magnitude improvements in simulator output which are sought by this project offer the only reasonable means for radiation hardness validation testing of larger components of military systems in the event of a treaty banning underground nuclear tests.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

o Demonstrated new inductive store component technology at high power.

o Increased x-ray source outputs by a factor of two over present state-of-the-art.

o Increased dose-rate capability by a factor of ten for large-area x-ray sources.

o Produced first set of lightweight, high voltage capacitors for use in advanced radiation simulator designs.

Current Year Plans:

o Develop initial designs for a radiation simulator capable of producing radiation output ten times greater than existing simulators.

o Demonstrate new inductive store component technology and radiation source coupling at increased power levels.

o Optimize radiation source output and dose-rate capabilities on existing radiation simulators.

FY 1991 Planned Program:

o Develop the technologies necessary to produce nuclear weapons effects required to test ensembles/small systems of electronics to DoD/JCS hardness levels.

o Investigate innovative concepts to increase radiation source outputs to provide DoD with an aboveground x-ray test capability for space systems.

o Develop high energy low inductance capacitors necessary for construction of system level aboveground nuclear weapons effects radiation simulators.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: M
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Biomedical Effects	23682	24844	27500	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project investigates the biomedical effects of nuclear radiation and other nuclear weapons effects on human beings and the environment. It focuses on: 1) research to protect troops from radiation-induced death, sickness, and combat degradation; and 2) the DoD "Nuclear Winter" Program. The Armed Forces Radiobiology Research Institute, the only major laboratory in the Western world devoted to effects of high radiation levels on humans, is supported under this project. The increased funding, starting in FY 1990, is required to define: 1) post-attack environments for Strategic Relocatable Target and recovery applications; and 2) effects of radiation on combat performance of aircraft crews.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

- o Evaluated drugs that promise to improve radiation sickness treatment.
- o Completed a biomedical model for fallout radiation effects.
- o Defined new treatments for gastrointestinal and bone marrow damage to maximize survival after radiation exposure.
- o Developed mesoscale (Nuclear Winter) models.

Current Year Plans:

- o Integrate crew radiation induced performance degradation effects into military battle simulations.
- o Begin evaluation of those drugs that were shown to increase survival after irradiation to determine whether they maintain the performance effectiveness of military personnel.
- o Continue long term medical follow-up of selected DoD participants in the Atmospheric Test Program and the occupation of Hiroshima/Nagasaki.
- o Assess role of chemicals that are released after irradiation.
- o Complete model to predict psychological impact of nuclear combat.
- o Define fire contribution to "Nuclear Winter".

FY 1991 Planned Program:

- o Evaluate drugs to prevent radiation induced nausea and vomiting.
- o Develop abilities to replace blood components which control infections with treatments which encourage cell regeneration.
- o Identify molecular mechanisms that can enhance radiation protection.
- o Validate drugs which extend radiation survivability without performance decrement.
- o Demonstrate performance enhancement associated with radiation protectants and immunomodulators.
- o Begin defining the effects of radiation on the combat performance of strategic aircraft crews.
- o Begin defining post-attack dust, smoke and radiation environments for Strategic Relocatable Target and recovery applications as regards crews.
- o Evaluate fire spread parameters to verify urban fire models.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: N
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Tactical Systems Vulnerability and Hardening	10168	10344	8900	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project explores technology needed to enhance theater U.S. and Allied command operation on an integrated battlefield. It also supports the Office of the Secretary of Defense (OSD), the Office of the Joint Chiefs of Staff (OJCS), the Services and U.S. and Allied commanders, by applying nuclear weapons effects research to improve theater nuclear weapons employment planning, command and control, force structure, arms control, damage estimation, and force employment.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

o Expanded OSD, OJCS, Services, and U.S. and Allied command support on sensitive U.S. policy and modernization issues.

o Continued at a lower level of effort Fallout Assessment System (FAS) and other nuclear weapons effects model automation to improve accuracy and speed of fallout calculations.

o Continued at a lower level of effort evaluations of available automation tools to support Commanders-in-Chief (CINCs) nuclear force management.

Current Year Plans:

o Provide vital nuclear study support to OSD, OJCS, the Services and U.S. and Allied commanders in an environment of reduced forces and budgets in response to emerging arms control initiatives.

o Perform evaluations and initiate documentation of selected automated nuclear support systems developed in prior years.

o Initiate new high-priority proof-of-concept (POC) demos automating nuclear command & control (C^2).

FY 1991 Planned Program:

o Continue vital nuclear study support to OSD, OJCS, the Services and U.S. and allied commanders.

o Complete evaluations of automated nuclear support systems and examine alternatives for specific nuclear applications. Recommend changes to conceptual design factors resulting from emerging technologies and nuclear operational requirements.

o Continue high-priority C^2 POC demos.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: Q
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Strategic Nuclear Implications and Assessments	6570	6396	5900	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project develops recommendations for alternative strategies for U.S. strategic weapon employment, increases understanding of the relationship between nuclear weapon effects and strategic nuclear employment objectives, and demonstrates automation of nuclear weapons planning necessary to carry out national strategic objectives. Research examines planning capabilities to provide nuclear commanders with more flexible weapon employment options.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

- Completed examination of the changing relationships between strategic and theater nuclear forces and North Atlantic Treaty Organization (NATO) reactions to current and future changes in weapon system employment or deployment policies.
- Completed delivery of Phase I Automated Routing Maintenance System (ARMS) software to JSTPS.
- Completed initial delivery of SHAPE Nuclear Analysis Program (SNAP).
- Began examining new alternatives for U.S. nuclear policies, technology, force structure, and strategy in the context of arms control and new technologies.
- Began assessments on operational employment of earth penetrating weapons (EPWs) and conventional targeting of selected strategic targets.
- Began Phase II of ARMS and ATT software development.

Current Year Plans:

- Continue assessments on operational employment of EPWs and conventional alternatives for strategic targets.
- Begin new efforts to examine relationships between strategic/theater nuclear forces and policy, and global views of U.S. strategy and policy decisions.
- Begin an assessment evaluating changing strategies, new strategic systems, and nuclear effects on planning and force structure for SAC/JSTPS.
- Begin efforts to improve SHAPE NPS, demonstrate integrated ACE nuclear planning, and develop plans to transition systems to operational control.

FY 1991 Planned Program:

- Complete current research endeavor examining new alternatives for U.S. nuclear policies, technology, and general strategy and the assessment of the impact of arms control agreements on strategic force structure.
- Complete delivery of Phase II software for ATT/ARMS to JSTPS.
- Complete final delivery of SNAP hardware and software to SHAPE.
- Begin examining the integration of strategic offensive and defensive planning and operations.
- Begin Phase III program for ATT/ARMS in support of JSTPS.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
Project Number: S
PE Title: Defense Nuclear Agency
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Strategic Structures Vulnerability and Hardness	33004	23055	32300	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project conducts research on the nuclear airblast, ground shock and water shock environments and on the response of structures to these environments. Emphasis is placed on strategic structures including land-based, sea-based and aerospace structures. It also emphasizes transfer of nuclear weapons effects technology to hardening designs against conventional weapons effects and investigates survivable basing technologies for U.S. nuclear weapons systems. Survivability efforts include both testing and developing technologies used in designing submarines, aerospace structures and missile silos. The increased funding required in FY 91 is to support OSD directed efforts in survivable basing, conventional weapon effects and to accelerate development of the deep underground simulator.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

o Continued to develop survivable basing technology to improve basing of nuclear and tactical systems.
o Fielded primary experiments on MISTY ECHO UGT.
o Conducted second proof of principle test of Deep Underground Simulator.
o Conducted forest blowdown and structures hardness experiments during MISERS GOLD high explosive test.
o Began investigating hardening of tactical airfield facilities (shelters, operations center, etc.).

Current Year Plans:

o Continue hardening research in support of Intercontinental Ballistic Missile (ICBM) modernization/ survivability.
o Characterize ideal surface, high overpressure airblast.
o Conduct shock tests on submarine hull models.
o Continue development of a deep underground simulator.
o Conduct phenomonology tests in support of DIA on effects of geology and ground shock on survivability/vulnerability of missile silos

FY 1991 Planned Program:

o Conduct quarter-scale test of upgraded missile silo.
o Test Shallow Buried Structures on the DISTANT IMAGE HE event.
o Participate with the Navy on a submarine shock test (RED SNAPPER).
o Characterize water shock/blue out environments for nuclear detonation in shallow water.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: V
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Nuclear Effects On Electronics	24829	25611	29100	Continuing

B. BRIEF DESCRIPTION OF PROJECT: This project uses phenomenology data developed in Project B to provide a technology base and direct assistance to the Department of Defense (DoD) to ensure that command, control and communications, and weapons systems will withstand direct nuclear radiation and electromagnetic pulse (EMP) effects. These effects can impair/disable satellites, missiles, and time urgent Fixed Ground Based Command, Control, Communication, and Intelligence (C^3I) ($FGBC^3I$) facilities such as MILSTAR, TRIDENT and GWEN. Through experimentation and theoretical analysis, this project seeks to direct interaction of these effects with systems, devise mitigation/protection measures, evaluate space systems' ability to "operate through" intense radiation environments, and develop test methodologies and hardening guidelines to obtain and maintain nuclear survivability.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

- o Demonstrated proof-of-concept (POC) hardened 64 kbit Static Random Access Memory/Silicon-on-Insulator (SRAM/SOI) with 35 nanosecond access time.
- o Hardened subset of SEMATECH fabrication technologies to radiation.
- o Demonstrated processor upset/recovery technology in test series.
- o Demonstrated radiation-hardened photonic electric field sensor.
- o Began EMP hardening testing of time urgent $FGBC^3I$ facilities.
- o Investigated fast risetime EMP effects on systems.
- o Tested ANMCC Site-R EMP protection.
- o Investigated Rail Garrison Source Region Electromagnetic Pulse (SREMP) interaction.
- o Implemented MIL-STD-188-125 EMP Protection Standard.
- o Initiated submarine V&H program.

Current Year Plans:

- o Develop hardened submicron tech-base using 1 Mbit SRAMs as POCs.
- o Develop rad-hard power integrated circuit technology.
- o Conduct above/underground test to verify system hardening technology to SDI threat levels in Operate Through Program.
- o Prepare source region EMP survivability criteria.
- o Publish guidelines for implementation of DOD-STD-2169A.
- o Complete MIL-HDBK-423, companion handbook for MIL-STD-188-125.
- o Test Strategic Air Command (SAC) $FGBC^3I$ facility.

FY 1991 Planned Program:

- o Develop hardening for quarter-micron circuit technology.
- o Develop POC rad-hard 256 kbit ferroelectric nonvolatile memory.
- o Demonstrate radiation hardened 256 kbit Complimentary Metal Oxide Semiconductor/Silicon-on-Insulator (CMOS/SOI) Technology.
- o Demonstrate subsystem end-to-end Operate Through hardening.
- o Execute system level component SREMP underground verification test.
- o Finalize the lethality assessment of fast risetime EMP effects.
- o Complete aircraft EMP Hardening Guidelines.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: W
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Small Business Innovation Research	3800	- 0 -	- 0 -	Continuing

B. BRIEF DESCRIPTION OF ELEMENT: This project is to stimulate technological innovation in the private sector, strengthen the role of small business in meeting DoD research and development needs, foster and encourage participation of minority and disadvantaged business in technological innovation, and increase the commercial application of DoD supported research and development results. This project responds to Public Law 97-219.

C. PROGRAM ACCOMPLISHMENTS AND PLANS:

Prior Year Accomplishments:

o Supported the Small Business Administration (SBA) National Direction by actively seeking small business contractors to perform innovative nuclear weapons effects research.

Current Year Plans:

o Continue active support of the SBA National Directive.

FY 1991 Planned Program:

o Continue active support of the SBA National Directive.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602715H
PE Title: Defense Nuclear Agency
Project Number: X
Budget Activity: Technology Base

A. RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	Total Program
Bioenvironmental Hazards Research	16500	- 0 -	- 0 -	33000

B. BRIEF DESCRIPTION OF PROJECT: This project provides for bioenvironmental hazards research activities to enable DoD to strengthen its efforts in developing technologies to protect DoD personnel, the civilian population and the environment from potential hazardous substances DoD generates and uses.

C. PROGRAM ACCOMPLISHMENT AND PLANS:

Prior Year Accomplishments:

o Conducted in-depth study of the hazardous material problem based on existing and ongoing research efforts in the areas of detection, disposal and clean-up of hazardous materials; validity and reliability of methods used to predict damage to the general population and its environment, and methods used to store, detoxify and reduce production of hazardous materials.

o Identified and presented topics where further research is required, placing emphasis on environmental issues unique to DoD and prioritized according to the impact on DoD personnel, the civilian population and the environment. Possible topics to be researched are:

o Improvements in the methods and instruments used for field identification, quantification, and evaluation of radioactive contamination released following a nuclear weapon accident.

o Disposal of the salts resulting from the demilitarization of chemical weapons.

o Environmental hazards involved in the destruction of ballistic missiles due to the INF treaty and proposed START treaty.

o Acquired the facilities and equipment required to conduct selected topics for research.

Current Year Plans:

o Funding for this research project terminates in FY89.

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H Budget Activity: Strategic Programs
PE Title: Verification Technology Demonstration

A. RESOURCES ($ in Thousands)

	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	To Complete	Total Program
START Treaty Technology	- 0 -	18000	43700	Continuing	Continuing
CFE Treaty Technology	- 0 -	1000	10300	Continuing	Continuing
CW Treaty Technology	- 0 -	14780	22000	Continuing	Continuing

B. BRIEF DESCRIPTION OF ELEMENT: This program element covers verification and compliance RDT&E for START, CW, CFE, Nuclear Test and other treaties. It includes the development of hardware and techniques for on-site inspections (OSIs) in treaty nations and facilitates U.S. compliance with treaty provisions. OSI complements national technical means of treaty verification. Associated costing studies, impact assessments, and implementation planning will also be performed. FY 1990 CW funds ($14.78M) were appropriated to the Army and are included here to clarify CW efforts to be accomplished by DNA.

C. PROGRAM ACCOMPLISHMENTS AND PLANS: (See Project summaries which follow)

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H
PE Title: Verification Technology Demonstration
Project Number: A
Budget Activity: Strategic Programs

A. (U) RESOURCES: ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	To Complete	Total Program
START Treaty Technology	- 0 -	18000	43700	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project covers RDT&E technology required for verification and compliance of the START treaty. It includes the development of hardware and techniques for on-site inspections (OSIs) in treaty nations and to facilitate U.S. compliance with treaty provisions. OSI complements national technical means of treaty verification. Associated costing studies, impact assessments, and implementation planning will also be performed.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

Current Year Plans:

FY 1991 Planned Programs:

Program Element: #0603711H Project Number: A
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

D. (U) WORK PERFORMED BY: Four federally funded research and development centers, 1 university, 8 private industry corporations, and 8 other DoD organizations.

E. (U) COMPARISON WITH FY 1989 DESCRIPTIVE SUMMARY:

F. (U) PROGRAM DOCUMENTATION: DNA appointed as the Executive Agent for Arms Control Treaty Related R&D; requirements are documented in the Verification Technology R&D Working Group monthly minutes.

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: START treaty negotiations; US-USSR MOU signed at Jackson Hole, WY, 23 Sep 89.

J. (U) MILESTONES SCHEDULE:

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H
PE Title: Verification Technology Demonstration
Project Number: B
Budget Activity: Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	To Complete	Total Program
CFE Treaty Technology	- 0 -	1000	10300	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project covers RDT&E technology required for verification and compliance of a Conventional Forces in Europe (CFE) treaty. This includes the development of hardware and software for on-site inspections (OSIs) in treaty nations and to facilitate U.S. compliance with treaty provisions. OSI complements national technical means of treaty verification. Associated costing studies, impact assessments, and implementation planning will also be performed.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
Current Year Plans:

FY 1991 Planned Program:

Program Element: #0603711H Project Number: B
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

D. (U) WORK PERFORMED BY: Private industry and national labs.

E. (U) COMPARISON WITH FY 1989 DESCRIPTIVE SUMMARY: New effort.

F. (U) PROGRAM DOCUMENTATION: Appointed as Executive Agent for Arms Control Treaty Related R&D.

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATIONS FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: CFE Treaty negotiations and US-USSR MOU signed at Jackson Hole, WY, 23 Sep 89.

J. (U) MILESTONE SCHEDULE:

FY 1991 BUDGET ESTIMATE RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603711H Project Number: C
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Title	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate	To Complete	Total Program
CW Treaty Technology	- 0 -	14780	22000	Continuing	Continuing

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITY:
This project covers RDT&E technology required for verification of and compliance with the Convention on Chemical Weapons. It includes the development of hardware and techniques for on-site inspections in treaty nations and to facilitate US compliance with treaty provisions. OSI compliments national technical means of treaty verification. Associated costing studies, impact assessments and implementation planning will also be performed. FY 1990 CW funds ($14.78M) were appropriated to the Army and are included here to clarify CW efforts to be accomplished by DNA.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:
FY 1990 Planned Program

FY 1991 Planned Program

Program Element: #0603711H Project Number: C
PE Title: Verification Technology Demonstration Budget Activity: Strategic Programs

D. (U) WORK PERFORMED BY: The equipment assessment and sampling methodology will be performed by the US Army Chemical Research, Development, and Engineering Center. The front end analysis will be conducted by a contractor to be selected. The SETA contractor (SAIC) will perform program integration.

E. (U) COMPARISON WITH FY89 DESCRIPTIVE SUMMARY: New effort.

F. (U) PROGRAM DOCUMENTATION: The key document is the Draft Convention on Chemical Weapons (CW treaty "rolling text"). Requirements occasionally are contained in the minutes of the USD(A)-chartered Verification Technology R&D Work Group meetings.

G. (U) RELATED ACTIVITIES: Work is being conducted by the US Army Program Manager for Demilitarization (PM DEMIL) at Johnston Atoll for destruction of chemical weapons. This work has been funded by the Army to meet the Congressionally-mandated date of 1997 to destroy existing chemical stocks.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Convention on Chemical Weapons being negotiated in the 40-nation Conference on Disarmament is the key document. Also included is the US-USSR MOU signed at Jackson Hole, WY, 23 Sep 89.

J. (U) MILESTONE SCHEDULE: